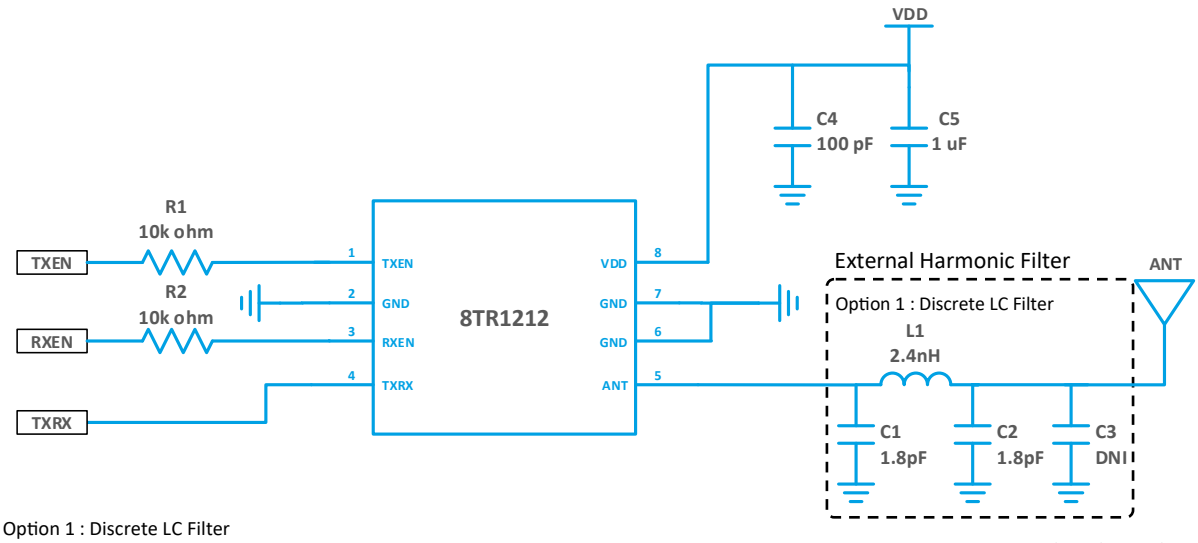
Application Notes

This application note describes the schematic, values and test results for the application of filters to remove harmonic products.
For more detailed product specifications of the 8TR1212, please check the datasheet.

Introduction

- Part Name: 8TR1212
- Test Board: BeRex 8TR1212 EVB
- Test Frequency: 2440MHz unless otherwise noted.
- Test VDD: +3.3V Test Vctrl: +1.5V
- Excluding RF Connector and PCB Loss
- Performance is sensitive to PCB parasitics.
  Therefore, custom PCB layout should emulate the Evaluation Board PCB layout attached to this design as closely as possible.

Application Schematic - Option 1: Discrete LC Filter



Option 1 : Discrete LC Filter
All inductors and capacitors must be populated and located as close as possible to ANT pin. Use ceramic multi-layer inductors for effective filtering.
Depending on layout, all inductor and capacitor values may require minor value tweaks for optimum impedance matching.

Figure 1. 8TR1212 Application Schematic - Option 1

Application Key Parts Value

Table 1. 8TR1212 Application Key Parts Value for Filter

Case	L1	C1	C2	C3
Without Filter	0ohm	DNI	DNI	DNI
Option 1	2.4nH	1.8pF	1.8pF	DNI

Application Board Layout

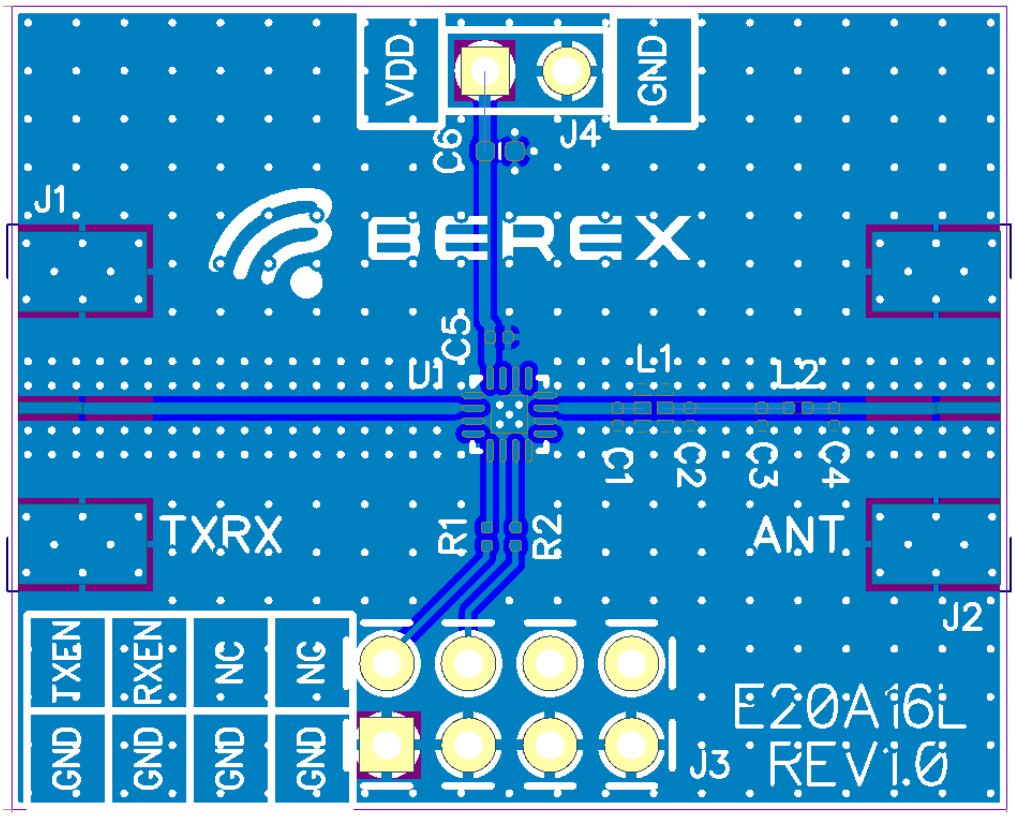


Figure 2. 8TR1212 Evaluation Board PCB Layout

Typical Transmit Measurement Data

Table 2. 8TR1212 Transmit Measurement Data

Parameter	Units	Without Filter	Option 1	Remarks
Saturated Output Power	dBm	10.4	10.1	
Large-Signal Gain	dB	12.4	12.1	@Psat
Current Consumption	mA	11.2	11.3	@Psat
Second Harmonic	dBm/MHz	-26.5	-44.9	@Psat
Third Harmonic	dBm/MHz	-33.4	-67.7	@Psat
4th~10th Harmonic	dBm/MHz	-30.4	-53.6	@Psat
Input Return Loss	dB	16.2	16.9	2.4~2.485GHz
Output Return Loss	dB	12.6	10.6	2.4~2.485GHz

Typical Receive Measurement Data

Table 3. 8TR1212 Bypass Measurement Data

Parameter	Units	Without Filter	Option 1	Remarks
Small-Signal Gain	dB	-1.7	-2.1	2.4~2.485GHz
Input Return Loss	dB	20.0	18.9	2.4~2.485GHz
Output Return Loss	dB	20.1	17.2	2.4~2.485GHz

Typical Transmit EDR Measurement Data

Table 4. 8TR1212 EDR Spectral Mask

Parameter	Units	2402MHz	2441MHz	2480MHz	Remarks
EDR Spectral Mask	dBm	6.1	6.8	6.9	EDR, 8-DPSK with 3-DH5 packets Data rate: 3Mbps Spectral Mask compliant
- VDD = 3.3V, TXEN = High, RXEN = Low or High, $T_{Ambient}$ = 25°C - Without Harmonic Filter - Excluding PCB and Connector Loss					

Typical Transmit Harmonics Characteristics

(VDD = 3.3V, TXEN = High, RXEN = Low or High, $T_{Ambient}$ = 25°C, F = 2440 MHz, Excluding PCB and Connector Loss, Unless Otherwise Noted)

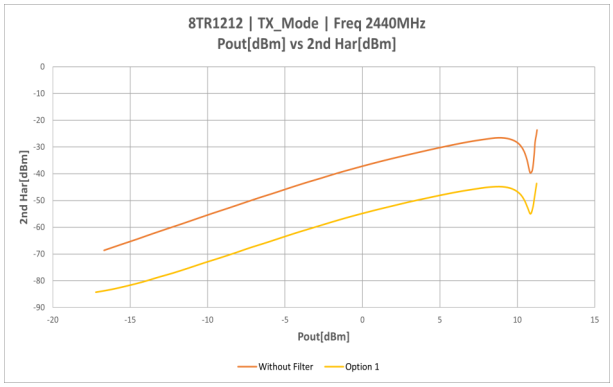


Figure 3. TX Pout vs 2nd Harmonic

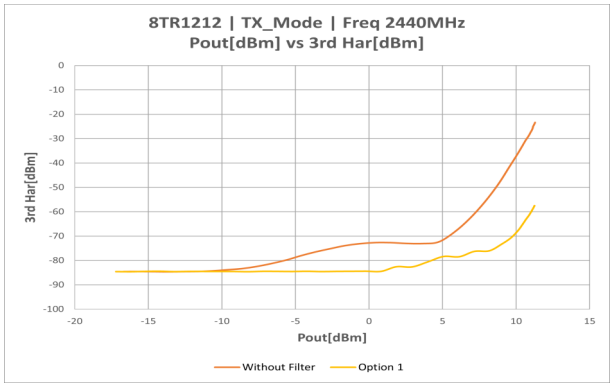


Figure 4. TX Pout vs 3rd Harmonic

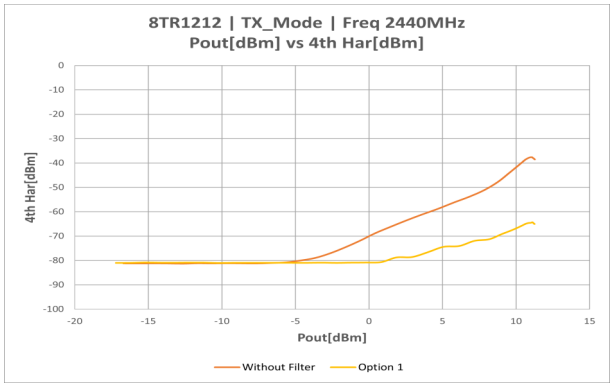


Figure 5. TX Pout vs 4th Harmonic

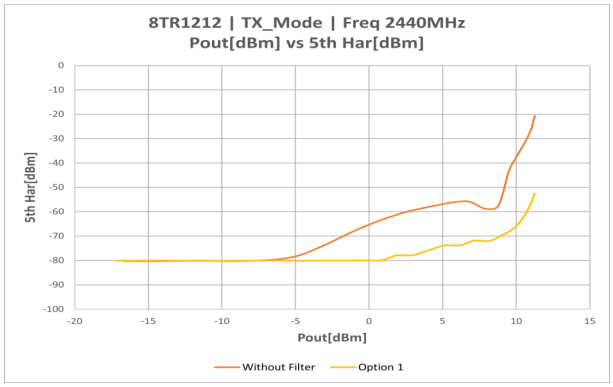


Figure 6. TX Pout vs 5th Harmonic

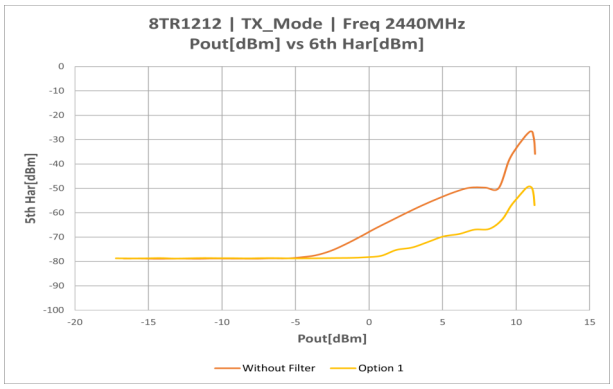


Figure 7. TX Pout vs 6th Harmonic

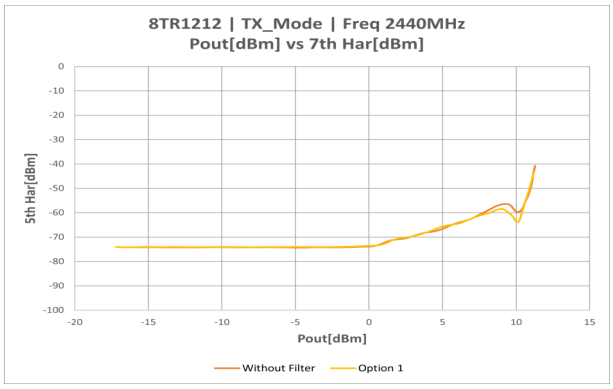


Figure 8. TX Pout vs 7th Harmonic

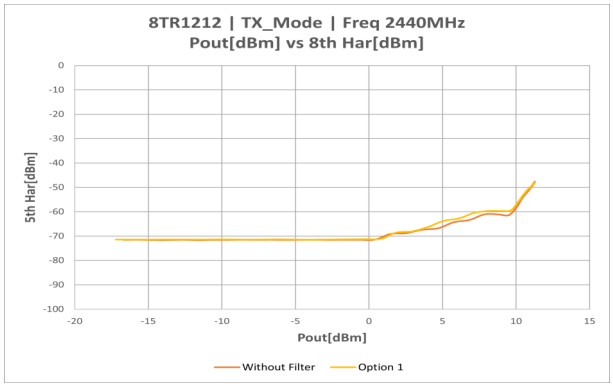


Figure 9. TX Pout vs 8th Harmonic

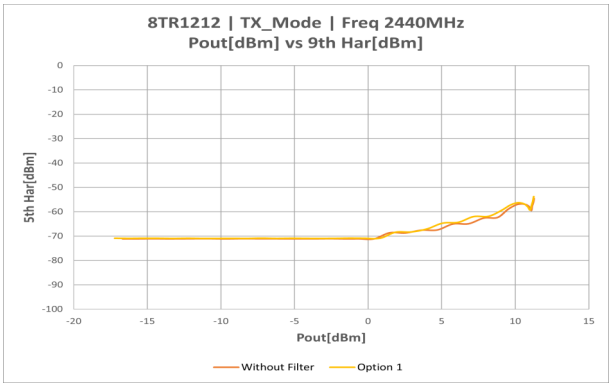


Figure 10. TX Pout vs 9th Harmonic

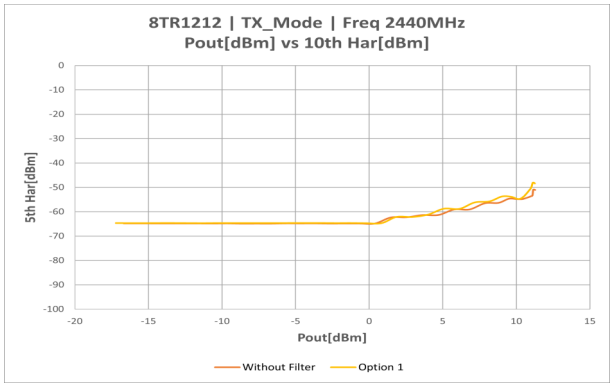


Figure 11. TX Pout vs 10th Harmonic

Typical Transmit EDR Characteristics

- VDD = 3.3V, TXEN = High, RXEN = Low or High, $T_{Ambient}$ = 25°C, Without Harmonic Filter, Excluding PCB and Connector Loss)
- Channel Frequency: 2402MHz/2441MHz/2480MHz (Ch0/Ch39/Ch78)

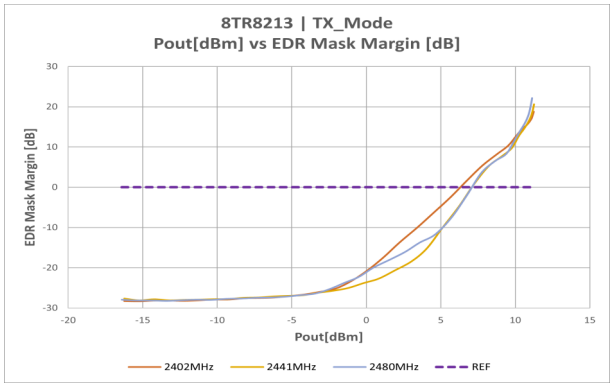


Figure 12. Pout vs EDR Mask Margin

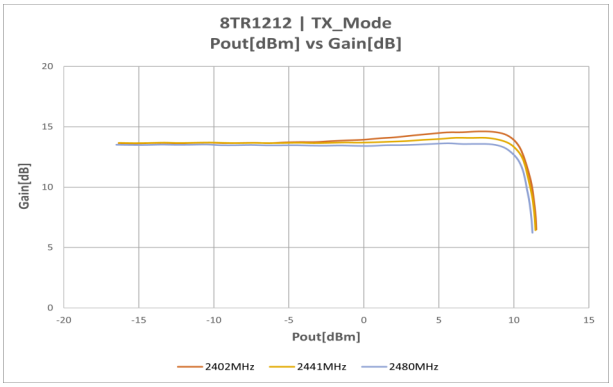


Figure 13. Pout vs Gain

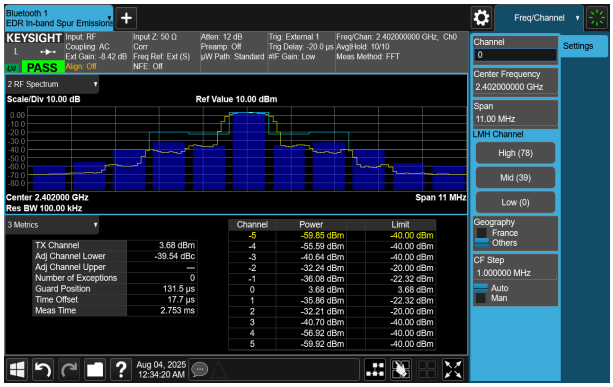


Figure 14. Ch0 EDR In-band Spur Emission

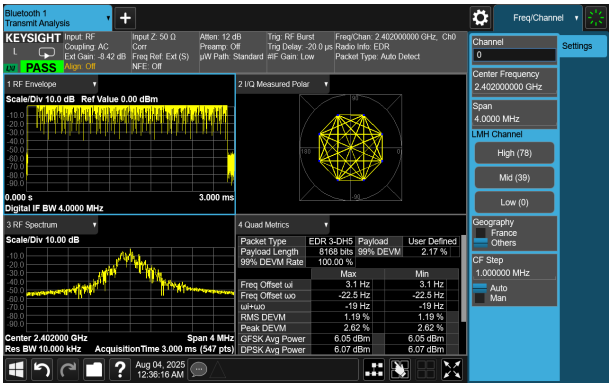


Figure 15. Ch0 Transmit Analysis

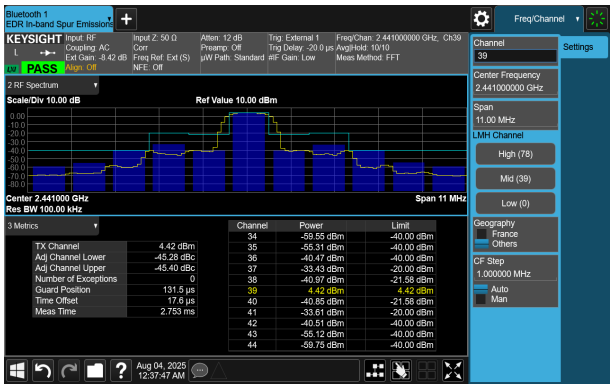


Figure 16. Ch39 EDR In-band Spur Emission

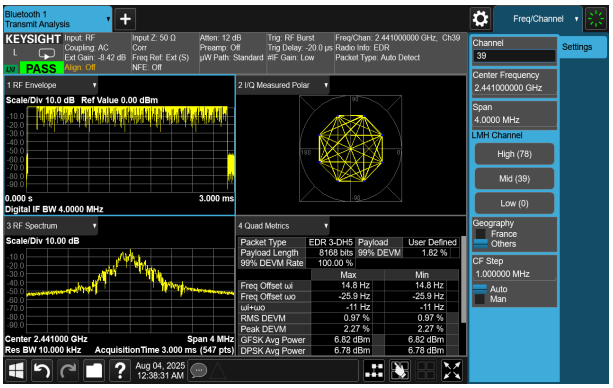


Figure 17. Ch39 Transmit Analysis

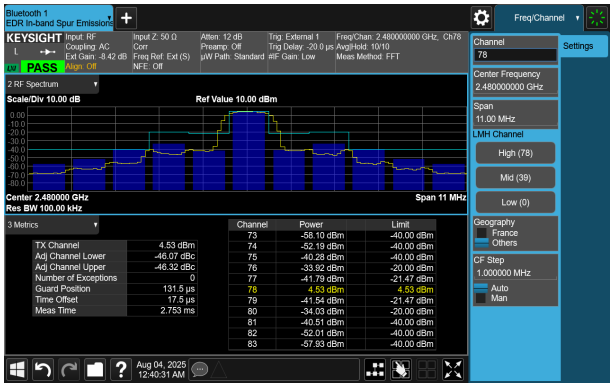


Figure 18. Ch78 EDR In-band Spur Emission

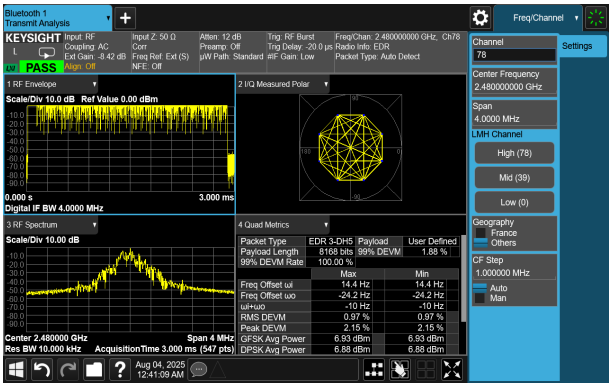


Figure 19. Ch78 Transmit Analysis